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THE FOREST SITUATION IN RAVALLI COUNTY MONTANA

by

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and

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Northern
Rocky Mountain
Forest & Range
Experiment Station
Missoula, Montana

M. Bradner, Director

FOREST SURVEY RELEASE NO. 21

JULY 1943

This is a Progress Report of the

FOREST SURVEY

in the

NORTHERN ROCKY MOUNTAIN REGION

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Acknowledgment and gratitude are especially due to Supervisor Brandborg and his staff of the Bitterroot National Forest.

Assistance in preparing the statistics of this report was furnished by the personnel of WORK PROJECTS ADMINISTRATION official projects O.P. 01-2-91-158, O.P. 65-2-91-105.

THE FOREST SITUATION IN RAVALLI COUNTY MONTANA

by

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WHY THIS REPORT HAS BEEN WRITTEN

As a member of Governor Steven's survey party about 1853, Lieutenant Mullan was among the first white men to visualize and proclaim the opportunities of the Bitterroot Valley - now Ravalli County. In the resources of land, water, grass and trees he foresaw the development of an economy to support many people.

Today, many of the valley's youth are fighting or mobilized against world forces threatening to undermine that economy; the resources, industries and people on the home front are mobilized for maximum production of sinews of war - food and wood.

Food and wood will be among the strategic materials not only for promoting and maintaining the peace but in maintaining the valley's future economy. Both are renewable resources, rooted in the soil and subject to deterioration or development through man's control of land use and management. Impairment of the basic capacity to produce, by forces from within, vitally affects the valley's economic and social foundations.

This report sets forth the present condition of the forest resource, indicates the trend toward a condition of greatly curtailed forest production under current forest land management practices and proposes remedial measures through which the downward trend may be lessened and eventually leveled off at a sustainable rate.

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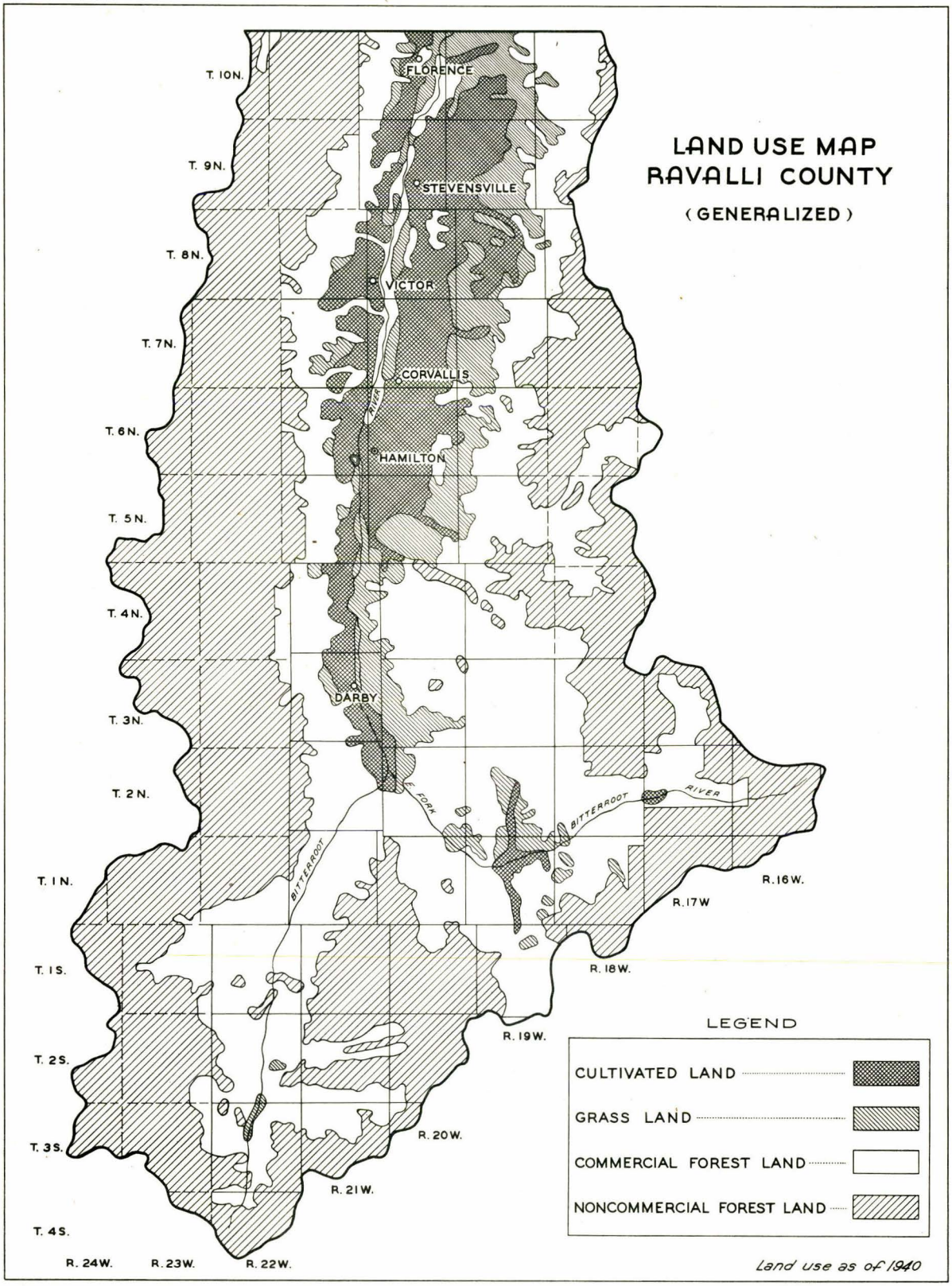

LAND USE MAP
RAVALLI COUNTY
(GENERALIZED)
FLORENCE
STEVENSVILLE
VICTOR
CORVALLIS
HAMILTON
DARBY
BITTERROOT RIVER
BITTERROOT
L. FORK
T. 10N.
T. 9N.
T. 8N.
T. 7N.
T. 6N.
T. 5N.
T. 4N.
T. 3N.
T. 2N.
T. 1N.
T. 1S.
T. 2S.
T. 3S.
T. 4S.
R. 24W.
R. 23W.
R. 22W.
R. 21W.
R. 20W.
R. 19W.
R. 18W.
R. 17W
R. 16W.
LEGEND
CULTIVATED LAND
GRASS LAND
COMMERCIAL FOREST LAND
NONCOMMERCIAL FOREST LAND
Land use as of 1940

A BRIEF DESCRIPTION OF RAVALLI COUNTY

Agriculture and the timber industry are the primary economic foundations of Ravalli County. Agriculture, the leading occupation, supports almost two-thirds of the 13,000 population. The value of farm crops ($2,749,470) is almost twice the value of the lumber cut from Ravalli County logs. Forest land, however, predominates, making up eight-tenths of the county's land area. Forests top the rolling hills to the east and clothe the rugged mountains to the west. Figure 1 gives a comparison of the land area in each use while the land-use map on the opposite page shows the location of the forests and the principal farming and grazing activities.

This valley is an area of light rainfall. Annual precipitation averages only 11 inches in the agricultural portions of the valley and ranges from 15 to 20 inches in the lower forested portions to probably 40 inches on the mountain summits. Because of light rainfall at least 90 percent of the farms require irrigation. Two large water storage reservoirs have been built, but their capacity represents only 80,000 acre feet or 17 percent of the total 475,000 acre feet of irrigation water used in the valley. Obviously then, the storage capacity of the forest land is essential to the agricultural industry. The land-use map

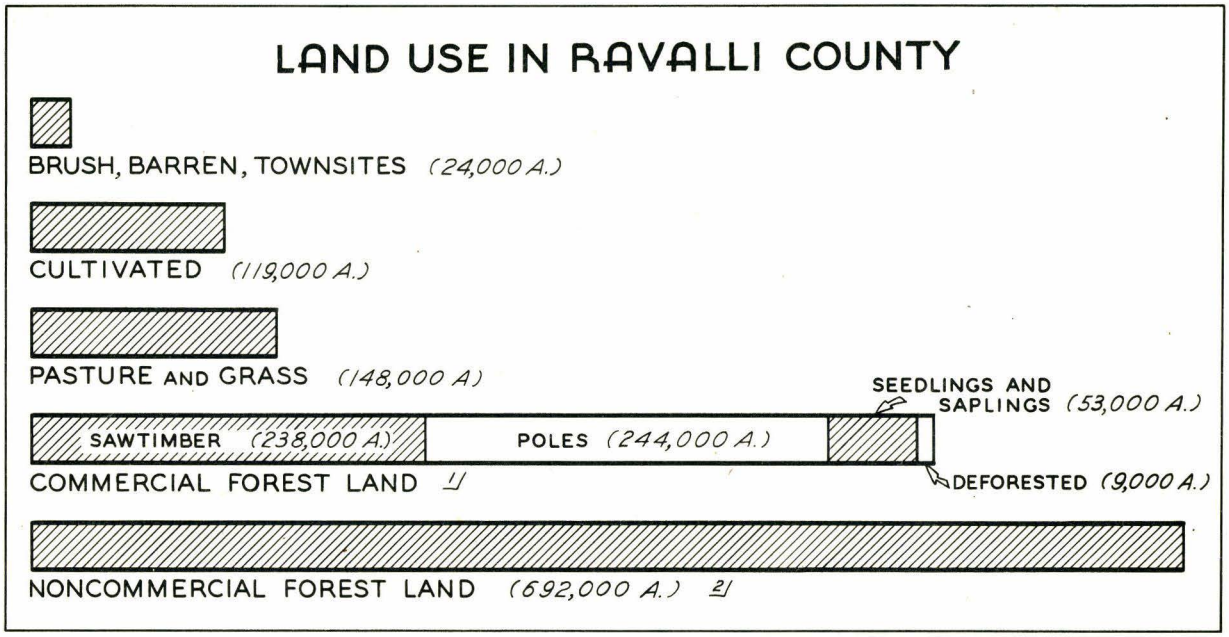

LAND USE IN RAVALLI COUNTY
BRUSH, BARREN, TOWNSITES (24,000 A.)
CULTIVATED (119,000 A.)
PASTURE AND GRASS (148,000 A.)
SEEDLINGS AND SAPLINGS (53,000 A.)
SAWTIMBER (238,000 A.)
POLES (244,000 A.)
COMMERCIAL FOREST LAND 1/
DEFORESTED (9,000 A.)
NONCOMMERCIAL FOREST LAND (692,000 A.) 2/

Figure 1. - Eight-tenths of the county area is forest land.

1/ Data approximately correct for January 1943.
2/ Of the 692,000 acres of noncommercial forest land, 333,000 acres of national forest land is reserved primarily for recreation; of this reserved area, about 31,000 acres is considered to have some value for commercial timber production.

Figure 2. - A fine commercial stand of ponderosa pine in the Rye Creek drainage.

---

opposite page 1 indicates how completely the irrigable lands are surrounded by forest.

The forest land of Ravalli County has been classified into two major divisions - commercial and noncommercial. Commercial forest land is defined as land available and suitable for producing operable stands of timber, i.e. generally suitable for production of saw timber, accessibly located and not now in a higher conflicting use. Noncommercial forest land is subalpine or other forest land of such low productivity or so inaccessible as to be unsuited to commercial timber production. Fifty-six percent of the forest area is noncommercial, the timber being of low quality and the country rough and inaccessible. It is important, however, for watersheds, outdoor recreation and fuelwood. These high mountain areas receive almost twice the precipitation of the main valley floor; hence, they are of primary importance in intercepting and storing water. The

Figure 3. - A noncommercial forest type. The trees are small, limby and crooked. Such forests covering a vast area are of vital importance for watershed cover, recreation and fuelwood.

---

heavy accumulation of snow during the winter provides a sustained and dependable flow of water for use in irrigating the valley farms. This rugged, picturesque, high country also is the foundation of Ravalli County's outstanding recreational advantages. In order to maintain its wilderness character almost half of the noncommercial area is reserved primarily for recreational use.

Of the 44 percent of the forest land classified as commercial, almost half contains saw-timber stands. Most of the remainder is stocked or partially stocked with growing stands; 9,000 acres is deforested as the result of past logging and fires. Figure 1 indicates the proportion of saw timber, pole, seedling and sapling stands. Owing to the unequal representation of age classes, sustained yield of forest products cannot be maintained unless cutting in

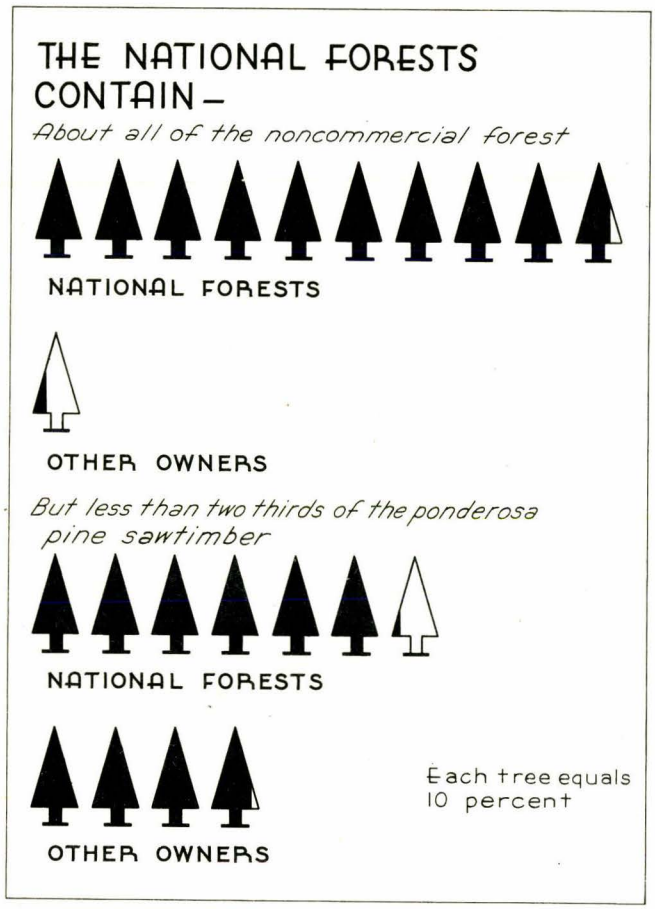

THE NATIONAL FORESTS CONTAIN –
About all of the noncommercial forest
NATIONAL FORESTS
OTHER OWNERS
But less than two thirds of the ponderosa pine sawtimber
NATIONAL FORESTS
OTHER OWNERS
Each tree equals 10 percent

Figure 4

the existing mature timber area is extended over the period required to develop the younger stands to saw-timber size.

The important item for the immediate future lumber industry is the 1 billion feet[1] of ponderosa pine which is the most abundant and most valuable species in the valley. The saw-timber stand illustrated in figure 2 is an example of the better commercial stands of ponderosa pine constituting the backlog of the lumber industry until the younger stands attain saw-timber size.

Besides the ponderosa pine there is 0.6 billion feet of other species (principally Douglas-fir) available for cutting. While not as valuable as ponderosa pine, Douglas-fir is assuming greater importance in recent years. Since 1939, this species comprised about one-fifth of the total cut of logs in Ravalli County; production in 1940 was in excess of 10 million board feet log scale, chiefly due to increased mining activities resulting from the war emergency. Although the local Douglas-fir timber is generally of rather poor quality with considerable ring shake and unsatisfactory for the better grades of lumber, it makes excellent mine timbers. The cut of species other than Douglas-fir and ponderosa pine is negligible.

WHOSE FOREST PROBLEM?

Since 84 percent of all forest land and 60 percent of the timber volume in Ravalli County is in national forest ownership, it appears that the future of the timber industry is chiefly the responsibility of the Forest Service. However,

1/ The volume here given is approximately correct as of January 1943.

two-thirds of the national forest land is noncommercial forest land and does not enter into the timber-producing picture at all. The following table shows who owned the ponderosa pine in saw-timber stands in January 1940:

	Million board feet[1] (Scribner log scale)	Percent
Large private owners	194.7	17.4
Small private owners	111.1	9.9
State	115.6	10.3
County	6.3	.6
Public domain	19.6	1.7
National forests	673.6	60.1
Total	1,120.9	100.0

1/ These data are as of January 1940. Since then (up to January 1943) approximately 115 million board feet log scale has been cut, chiefly from private and State lands.

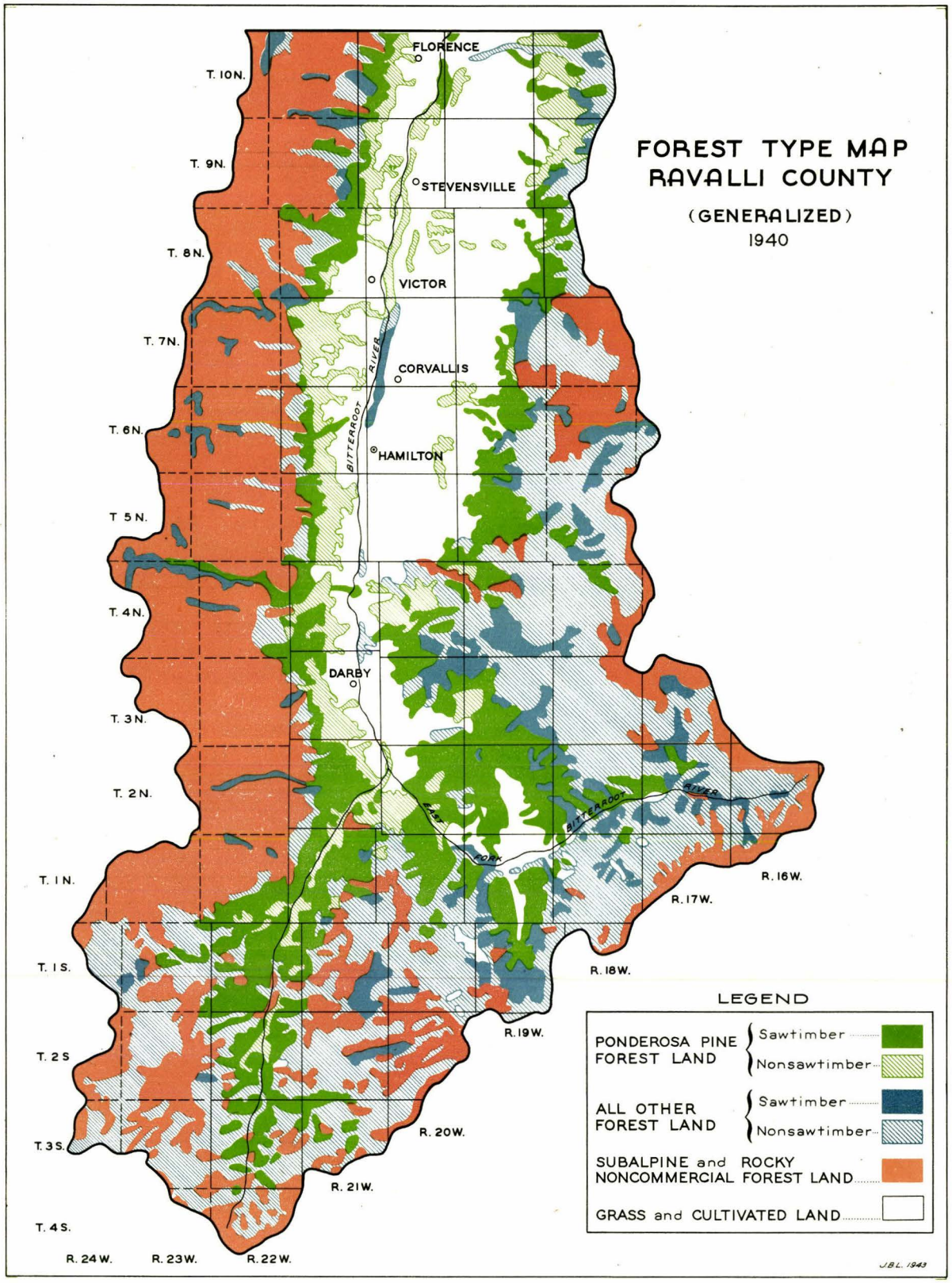
Although private and State holdings have been heavily logged since January 1940, this does not diminish the importance of these ownerships for long-term timber production. These ownerships include 35 percent of the commercial forest land area in the county; furthermore, the private ownership includes the lower more accessible land of better than average site[1] quality.

Considering the variety of ownerships and lack of balance between stand classes within ownerships, it is obvious that the stability of the forest industry depends upon the cooperative effort of all agencies and people in the county working toward a common objective.

. . . . . .

. . . . .

1/ Site refers to the capacity of forest land to grow commercial timber. In this county the pine lands are divided into four classes (III to VI) in which Site Class III represents the best and Site Class VI, the poorest land for growing commercial timber.


FOREST TYPE MAP
RAVALLI COUNTY
(GENERALIZED)
1940
FLORENCE
STEVENSVILLE
VICTOR
CORVALLIS
HAMILTON
DARBY
BITTERROOT RIVER
EAST FORK
BITTERROOT RIVER
T. 10N.
T. 9N.
T. 8N.
T. 7N.
T. 6N.
T 5N.
T. 4N.
T. 3N.
T. 2N.
T. 1N.
T. 1S.
T. 2S
T. 3S.
T. 4S.
R. 24W.
R. 23W.
R. 22W.
R. 21W.
R. 20W.
R. 19W.
R. 18W.
R. 17W.
R. 16W.
LEGEND
PONDEROSA PINE FOREST LAND
Sawtimber
Nonsawtimber
ALL OTHER FOREST LAND
Sawtimber
Nonsawtimber
SUBALPINE and ROCKY NONCOMMERCIAL FOREST LAND
GRASS and CULTIVATED LAND
JBL. 1943

THE TASK OF MAINTAINING ADEQUATE TIMBER PRODUCTION

The rate of cutting in recent years greatly exceeds sustainable production. Insects took a tremendous toll prior to 1933. Depletion from fire has not been serious. If the timber industries are to be maintained at a desirable level, more growing stock must be reserved in logging, the cutting rate on private and State lands must be lowered, restocking of cutover lands must be made more effective, damage from insects must be abated and the past fire record upheld.

INCREMENT VS. DRAIN

In order to maintain a forest industry on a sustained basis, drain ultimately must be brought into balance with increment which under stand conditions prevailing in 1940 (appendix table 8) was calculated to be 13 million board feet of all species, 7 million board feet of ponderosa pine. This is the estimated board-foot volume increase during that year before adjustments for drain. Drain (appendix table 10) in recent years has averaged 38 million board feet of all species, 31 million board feet of ponderosa pine. In 1940, however, the drain of ponderosa pine alone was approximately 40 million board feet. The difference between increment and drain or approximately 33 million board feet of ponderosa pine in 1940 indicates the extent that the growing stock or forest capital of this species was reduced during that year.

Such a liquidation process is justified in areas having extensive stands of decadent old growth to the extent that it accelerates the conversion of such stands to a productive saw-timber condition. Selective cutting is the only practicably effective means by which this objective can be attained. In 1940, there were some 143,000 acres of old growth ponderosa pine stands (appendix table 4) in which gross increment on an average no more than offset mortality resulting from insects, decay, windfall and other causes. Until the decadent elements of such stands are removed, this condition of no net increment will prevail. In some cases actual retrogression may occur. Under selective cutting practices that remove only the trees likely to die in the interval between the first and succeeding cuts, net board-foot increment on these areas may be increased from zero to from 60 to 100 board feet per acre or a total average annual increment of 9 to 14 million board feet. The extent that this added increment is realized depends entirely upon the character and rate of cutting. If the entire area of 143,000 acres were cut over at a uniform rate within the next 20-year period and with the objective of maintaining the

optimum board-foot growing stock, an average annual increment of 4½ to 7 million board feet might be realized or a total of 90 to 140 million feet for the 20-year period. With no selective cutting little, if any, board-foot increment is likely to be realized from this area for many years. Furthermore, there will also be a very appreciable and otherwise irrecoverable loss in volume of high quality trees that will succumb ahead of the cut.

LUMBERING

General

The immediate task is to make the best of what is left of the timber supply. The county is rapidly approaching the end of its "big time" timber operations, which began in 1891 with the opening of a mill at Hamilton. This mill cut an average of 30 to 40 million board feet of lumber per year until it was dismantled in 1915. Since then, the log cut of the operating company has been milled in Missoula County. During recent years, the annual cut of this company in Ravalli County has averaged about 30 million board feet.

Besides the one large operator in the county, there are about 13 small sawmill operations with annual productions in recent years ranging from less than 50 thousand to 7 million board feet. These mills are now cutting less than half of their timber from private lands; two to five years hence they are likely to be entirely dependent on the national forest since the total stand of all ponderosa pine private saw-timber holdings in the county is estimated at about 200 million board feet.1/

Cutting Methods

The most common method of logging private timber has been to liquidate all trees that appear to have any immediate value. In the characteristically overmature stands of ponderosa pine of this district, this is tantamount to clear cutting. From the public standpoint, it is desirable that some partial cutting method be adopted that will assure continued production of saw timber by reserving trees that are likely to survive until the next cut. Although it may actually yield greater net profit than clear cutting, partial cutting has not always been practiced even by owners

1/ Volume as of January 1, 1943.

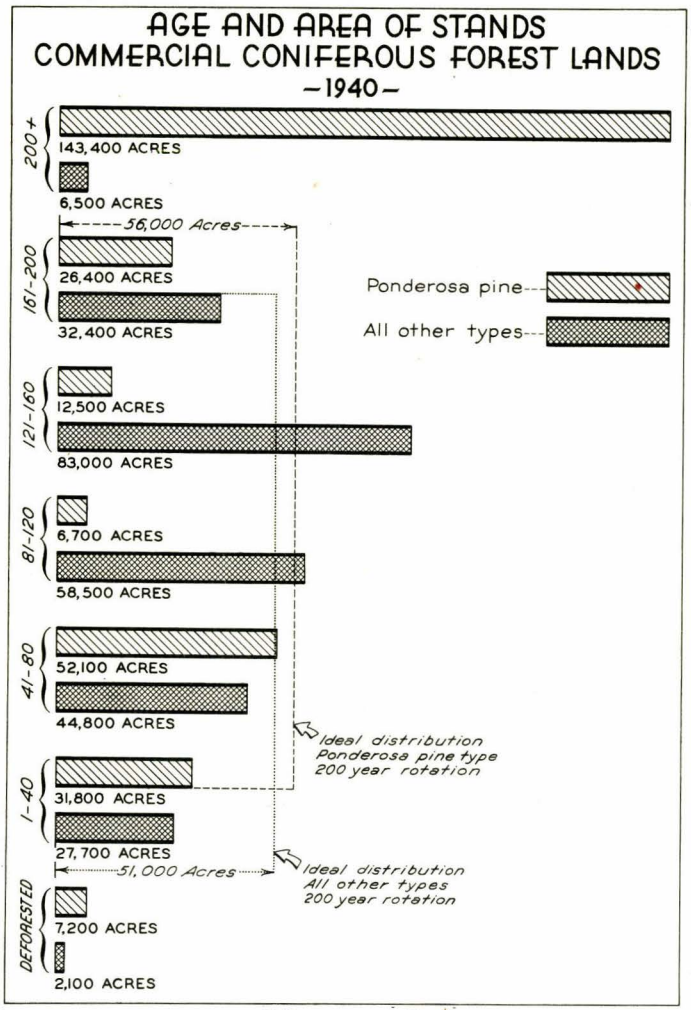


Figure 5

who aim to hold their land for timber production. National forest lands and more recently some State forest lands are being cut more with the long-time viewpoint in mind than are private lands. Vigorous trees suitable for lumber now are being left to put on growth which will increase their value. In general, the policy of partial cutting has four features which recommend it:

1. Where a large proportion of the timber in a management unit is overmature, the problem of preserving that timber until the time of logging is a serious one. The timber is ripe and cannot be held indefinitely. Insects and disease find it easy prey. Yet if a permanent lumber industry is to be maintained within that unit, the cut of the old growth must be spread over the period required to develop second growth to saw-timber size. This is the situation that exists with regard to the ponderosa pine stands in Ravalli County as figure 5 and appendix table 4 show.

Partial cutting offers a means of partly solving this difficulty. By cutting only half the volume including trees most susceptible to insect damage, the more vigorous timber is left for future logging, the conversion of old growth from a nongrowing to a growing condition is accomplished more rapidly and more of the mortality ahead of the initial out is utilized.

2. Partial cutting provides a more abundant seed source. This is important in many local ponderosa pine stands since good seed years followed by good growing years

for seedlings are infrequent. If the seed source is inadequate when a favorable wet year occurs, the chances for restocking the open areas are lessened.

3. If the saw-timber trees to be left are chosen carefully for vigor, they will accelerate in growth in response to added growing room. It is worth while to leave these trees because the growth they add is especially valuable - the best lumber is on the outside of large, clear logs. Figure 6 shows where the most value lies in a high grade 23-inch log.

4. Since logging larger trees returns bigger profits per thousand feet than small trees (small trees may even be handled at a loss) even the immediate returns may be substantially increased through partial logging. Anderson[1] found that, on the average, trees smaller than 20 inches d.b.h. are logged at a loss.

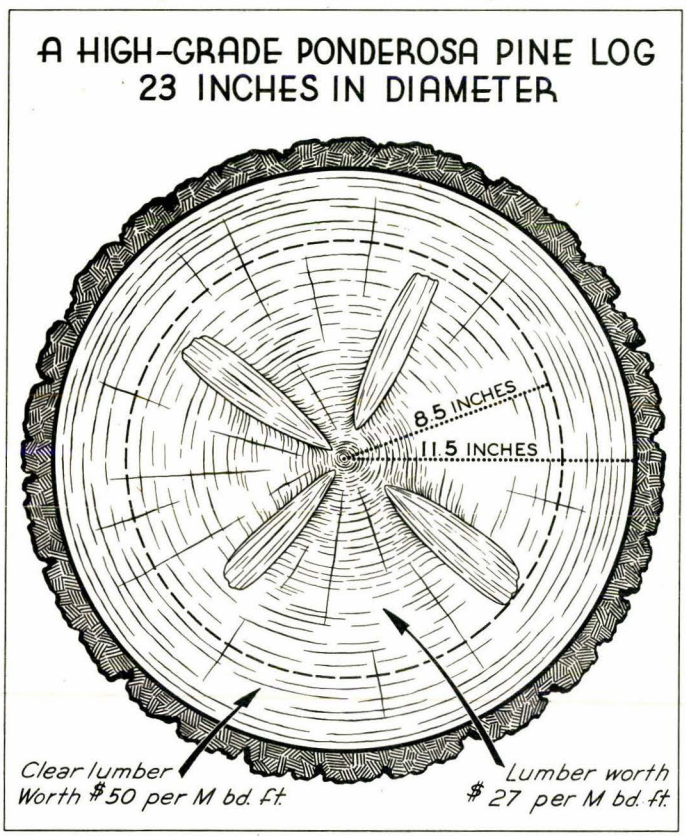


Figure 6. - The fact that growth on a large log is worth much more than growth on a small log is a strong argument for partial cutting.

. . . . .

The volume that should be left in logging ponderosa pine stands varies widely with local stand conditions. In young or many-aged stands considerable volume can be left; in uniformly decadent stands with no advance reproduction, the only alternatives are to leave sufficient seed trees or to regenerate by planting. The national forest management plan in the Bitterroot Valley provides for leaving on an average one-third of the board-foot volume of trees larger

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1/ I. V. Anderson. Application of Selective Logging to a Ponderosa Pine Operation in Western Montana. State University of Montana Studies, No. 2. July 1934.

than 12 inches d.b.h. with modifications to meet variations in different stands.

Figure 5 on page 9 shows the preponderance of old-growth ponderosa pine stands, the deficiency of young stands of this type and hence the need for partial cutting to maintain a high sustained saw-timber production. Clear cutting at the rate justified to reduce mortality losses as rapidly as practicable will result in a high production for a few years and drastic curtailment later. Furthermore, such a procedure does not correct the unbalance in age classes; it merely shifts the unbalance from saw-timber stands to reproducing stands that will be inoperable for many years. Fortunately, individual trees in old-growth ponderosa pine stands vary greatly in vigor - ranging from thrifty trees that are making satisfactory net growth to decadent trees that are either gradually dying out of the stand or in which decay offsets growth. These old stands consequently can be rejuvenated by removing only the decadent elements in the first cut.

The age-class[1]/ and area distribution of types other than ponderosa pine is relatively good. The stands of timber in the younger age classes are sufficient to supply material as the oldest stands are cut over.

Partial cutting is a standard practice on national forests where it is judged feasible. More recently the State of Montana has adopted this method of cutting on some of its holdings. In order to stabilize the forest industry in Ravalli County at a high level, it is desirable that this method of management be applied also to private lands.

In connection with partial cutting it is well to note that within limits there is a direct correlation between growth and the volume left at cutting; the larger the volume of growing trees left, the greater the yield. This relationship

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1/ An age class includes all the trees in the same age group, usually in 20-year classes; i.e. all trees from 21 to 40 years old, all trees from 41 to 60, etc.

is clearly brought out in the following table from a study by Meyer.[1]

BOARD-FOOT VOLUME GROWTH, SCRIBNER RULE, IN SELECTIVELY[2] CUT STANDS OF PONDEROSA PINE OF AVERAGE STRUCTURE[3] SITE QUALITY IV

Volume per acre left at time of cutting	Volume per acre 50 years after cutting	Average annual increase in volume per acre for 50-year cycle
Board feet	Board feet	Board feet
1,000	3,200	44
2,000	5,200	64
3,000	6,700	74
4,000	8,100	82
5,000	9,500	90

From this table it is obvious that where the stand vigor[4] and structure permit, a material increase in yields can be realized by leaving adequate growing stock at the time of the initial cutting. Near Greenough on the Blackfoot River[5] a ponderosa pine stand cut in 1887 and relogged in 1927 gave an average annual yield of slightly over 100 board feet per acre per year for the 40-year period indicating that Meyer's results are too conservative for the better western Montana pine lands.

With the successful development of cheaper truck and tractor logging methods, partial cutting is becoming more practicable. The construction of well located roads would

1/ From table 8 of Technical Bulletin No. 407. Growth in Selectively Cut Ponderosa Pine Forests of the Pacific Northwest, April 1934.
2/ "Selectively" is a term used for partial cutting.
3/ Structure refers to stand composition with particular reference to the size and vigor of individual trees; "average structure" here means that 75 percent of the trees by volume are at least moderately vigorous.
4/ Vigor refers to health and thrift of the trees in the stand.
5/ I. V. Anderson. The Forest Problem in Western Montana. Journal of Forestry, Vol. XXXI, No. 1, January 1933.

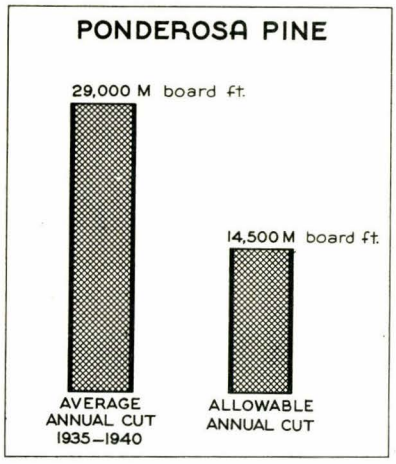

Figure 7

do much to make partial cutting possible in the remaining timber stands of Ravalli County. This is one of the very important needs in the proper handling of the local forest situation.

The Rate of Cutting

Figure 8 shows the trend of ponderosa pine sawlog production in Ravalli County over a decade and a half. It shows that only a small part of the timber has come from the Bitterroot National Forest. As a matter of fact, the allowable cut under sustained yield on the national forest is about three times greater than the actual cut on this forest during the period 1935-1940. Cutting of national forest pine was held back to offset the heavy drain on State and private timber. However, in order to meet increased demands for war needs and encourage maximum production by local mills, this limitation has been temporarily relaxed.

Most of the logs are shipped out of the county for manufacture (in the period 1935-1940, seventy percent); the milling of these logs is done in Missoula County.

If in 1941 a plan could have been put into effect to pool all the ponderosa pine land in the county - State, private and Federal - on a sustained-yield basis, with proper selective cutting to leave an adequate growing stock, these lands could have been organized to produce an annual yield of about 14½ million feet of pine. The actual cut of pine for the six-year period, 1935-1940, was 29 million feet. In 1941 and 1942, partly owing to war demands, the cut has been considerably greater.

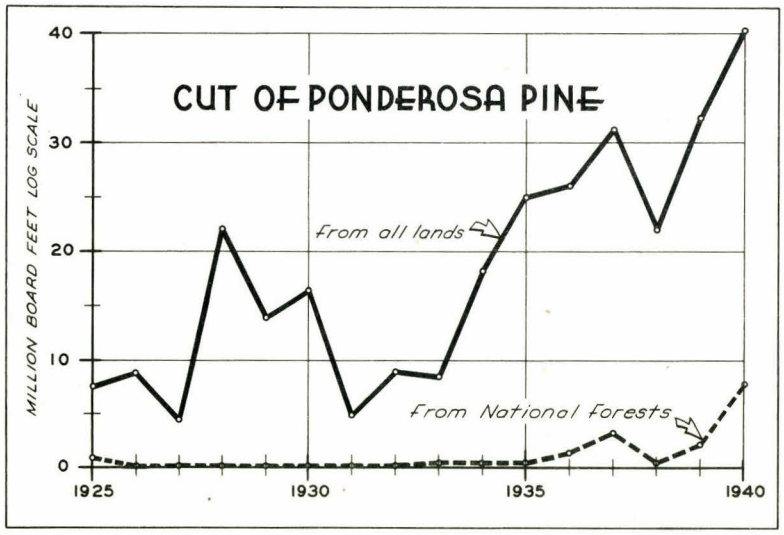

Figure 8

At the past rate of cutting and

Figure 9. - The epidemic of Mountain Pine beetles, which spread through Montana from 1909 to 1933, probably destroyed 7 billion board feet of timber over the State1/. The picture above shows the tremendous fire hazard resulting from the tangle of dead, standing and fallen trees.

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with the present plan of the owners, the private and State timber will be exhausted in a relatively few years, and the annual cut of pine in the Bitterroot Valley may be expected to drop to 7½ million feet - the calculated sustained yield of the national forest - plus an indeterminable quantity from residual stands in other ownerships. It is probably too late now to develop any coordinated plan of management which will prevent this outcome.

Since cutting on private lands has generally been very close, it is not to be expected that there will be a second cut of saw timber on these lands for perhaps 100 years. Nevertheless, most of the cutover area probably will produce another crop of timber and long-time planning demands that full consideration be given to the future of the cutover forest land in the valley.

INSECTS

The insect loss in the past has been extremely serious. In an epidemic that raged from 1920 to 1933, the Mountain Pine

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1/ Estimate by James C. Evenden, U.S. Forest Insect Laboratory, Coeur d'Alene, Idaho.

beetle killed 85 percent of the mature lodgepole pine leaving a desolation which in places was almost as complete as if these areas had been swept by fire. Although the lodgepole pine killed was not of high commercial value, the resulting jungles of fallen trees (figure 9) constitute a high fire hazard and have rendered large areas unsuitable for grazing.

The damage to ponderosa pine was less complete, but the economic loss was much greater. Some experts estimate that as much as 25 percent of the ponderosa pine saw timber in the county was killed during this period. Since bug-killed trees become worthless for lumber within a few years after death, this pine has been lost to the lumber industry. It is estimated that the ponderosa pine lost from this cause had a stumpage value of $750,000 and that the loss of stumpage value, wages and operating income totaled approximately 10 million dollars.

The causes for the severe insect epidemic are not definitely known. Possibly the overmature condition of the timber was an important factor. Old trees may have lacked the vigor to stem the attack, and a combination of dry seasons and mild winters may have favored the beetles. Expansion of the road system will increase the possibilities of utilizing susceptible trees more rapidly and of salvaging insect-killed timber, thereby reducing the probabilities of large losses in the future.

FIRE

No large forest fires have occurred in this valley for over two decades. From 1920 to 1940, fires covered a total of only 23,000 acres of national forest land. This is an annual average of 10 acres in 10,000 as compared to 45 acres for the Northern Rocky Mountain Region as a whole. Tables 6 and 10 in the appendix show that for the period 1931-1937 inclusive, the timber destroyed by fire annually in all Ravalli County was only one-three-thousandth part of the standing volume. For ponderosa pine alone the loss was even smaller, amounting to one-ten-thousandth annually. Fuel types are not of the explosive character found in the western white pine types, but fires occurring in the lodgepole pine tangles are difficult to control.

Many privately owned areas have been burned too severely in connection with the disposal of logging debris. The primary purpose of this clean-up work following logging is to reduce the fire hazard. Obviously, when slash disposal fires burn uncontrolled over an area, they defeat their own purpose

by destroying the trees they are set to protect. This loss is particularly regrettable in a locality like the Bitterroot Valley where the original hazard that is being reduced is not particularly high.

On the whole, slash disposal has been one of the less successful management practices on State and private lands in the Bitterroot Valley, because of damage done to residual stands. Under existing State law the maximum charge the State may require for slash disposal on private lands recently was raised from 15 to 25 cents per thousand board feet of timber cut. An additional amount of money is applied from the State's Clarke-McNary allotment for supervision and purchase of equipment. Henceforth a more satisfactory type of slash disposal may be expected. The State has been spending about 40 cents per thousand on State land for slash disposal. The Forest Service by expending 40 to 75 cents per thousand board feet disposes of approximately 75 percent of the slash on national forest timber sales. Past results indicate that this policy has been satisfactory. However, there is a tendency to consider this amount of disposal as more complete and expensive than necessary. Whether the past small fire losses are evidence of more intensive slash disposal than is necessary or are an indication that nearly complete disposal is needed to hold fire losses to a minimum is an open question. Changes in the degree of disposal should probably be applied with caution. Owing to the present emergency and acute manpower shortage, current slash disposal is not keeping pace with current accumulation.

THE OWNERSHIP FACTOR

That private forest lands are, in general, not being handled in a way most beneficial to future yields and incomes is partly attributable to the fact that most owners do not expect to realize from the added investments, which such better practices would oblige. Long-time forest landownership, particularly on the poorer sites, is not an attractive proposition in Ravalli County and most of western Montana as well. Because of slower growth and unfavorable transportation costs, this region is at a disadvantage in competing with the West Coast and the South for the eastern lumber market. Financially, the large private landholders are more able than the small owner to make long-time investments in forest land. But even for them, the financial advantages of clear cutting apparently have outweighed the desirable features of partial cutting.

TAXES

The forest resource is an important source of county revenue. Ravalli County had slightly over 40,000 acres assessed as timberland in 1942; the average tax per acre in that year was 19 cents.1/ Presumably the lands assessed as timberland are saw-timber stands.

It is interesting to note that Ravalli County's timberland tax base shrank from 90,000 acres in 1923 to 40,000 acres in 1942. The change in assessed total value of timberlands was even greater - $1,627,791 in 1924 to $372,493 in 1942. Figure 10 shows what is happening to Ravalli County's timberland tax base.

Taxes in Ravalli County do not seem to be a particularly significant item in maintaining forest lands in private ownership. Once the land is cut over it is classed as grazing land and ordinarily taxed at an average rate of 8 cents per acre.

As yet, Montana has no forest land tax law that allows the postponement of the major portion of the tax load to the time the stand is harvested. Various forms of such laws are in effect in other states; their common goal is to charge a nominal tax on reproducing and growing timberlands and to collect a fixed portion of the stumpage realization when the timber is cut. Such a law might be a desirable forward step in Montana although it is well to observe that in other states having such a law, relatively little land has been as yet placed under this taxing system. Obviously, taxes are not the single limiting factor in holding growing timberlands in private ownership. The big advantage in such a law is the assurance to the timber owner that his tax obligation is limited and definite and will not become an unforeseen burden.

Up to and including 1938 2/ Ravalli County had acquired 705 pieces of property through tax delinquency totaling 44,994 acres, mostly of cutover areas and submarginal farms. On June 1, 1940 2/ there were over 22,000 acres tax delinquent.

Actually the practicability of managing private timberlands for continued production has been pretty well demonstrated. A study in 1933 3/ showed the profitable cutting of an area

1/ State Board of Equalization - Biennial Report.
2/ From "Land Use and Taxation Problems of Ravalli County" report by C. B. Sutliff. January 3, 1941.
3/ I. V. Anderson. The Forest Problem in Western Montana, Journal of Forestry, Vol. XXXI, No. 1, January 1933.

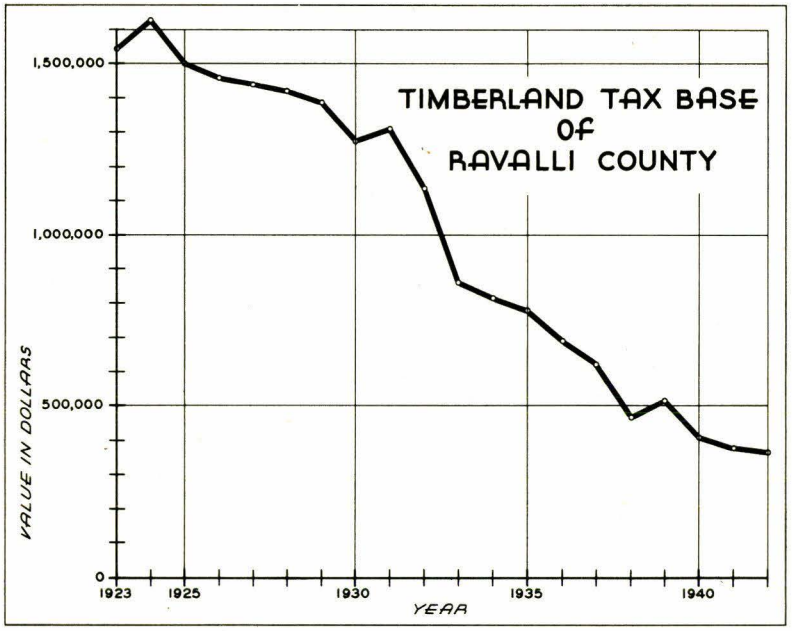

Figure 10

near Greenough on the Blackfoot River in Missoula County in 1927, which had been logged in 1887. This area paid protection and administration costs, taxes, 6 percent simple interest on the investment (about $2 per acre in 1903) and a net profit of $1.25 per thousand board feet cut in 1927.

This single study may not be considered as conclusive, but it should be remembered that the cutting on the area cited was economic clear cutting and removed all trees having a positive value. Also, the management was extensive without the care and salvage obtainable by a small owner living on the land. This phase of management is discussed beginning on page 28.

In all cases where private owners of forest land are ready and willing to manage their lands for permanent forest production, every encouragement should be given them to retain possession and keep the lands productive.

Where such a program does not appear practicable for the present owner and the land is apt to be abused or abandoned to tax delinquency, it is far better that provision be made for it to come into permanent public ownership so that care and protection in the future is assured. About 90 thousand acres of excellent forest land in the valley, logged 20 to 50 years ago, has restocked and developed to promising stands of second-growth ponderosa pine. The extent that these stands contribute to the county's forest industry depends upon their management during the next 30 to 50 years. Not infrequently in the past, such stands have been clear cut for fuel upon attaining cordwood size or logged for saw timber at the beginning of the period of highest board-foot growth. Public control of forest practices would have prevented this.

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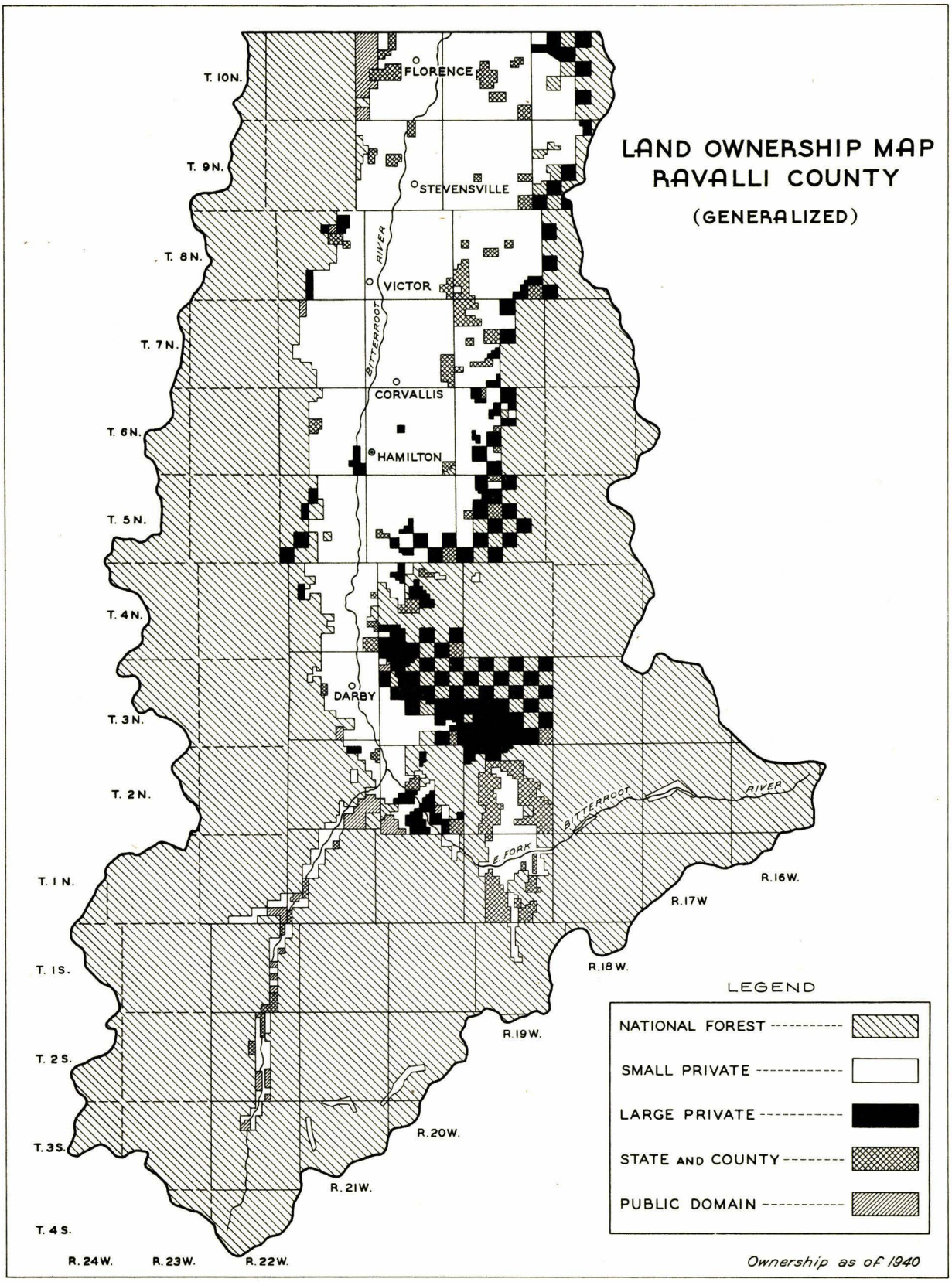
LAND OWNERSHIP MAP
RAVALLI COUNTY
(GENERALIZED)
T. 10N.
T. 9N.
T. 8N.
T. 7N.
T. 6N.
T. 5N.
T. 4N.
T. 3N.
T. 2N.
T. 1N.
T. 1S.
T. 2S.
T. 3S.
T. 4S.
R. 24W.
R. 23W.
R. 22W.
R. 21W.
R. 20W.
R. 19W.
R. 18W.
R. 17W
R. 16W.
FLORENCE
STEVENSVILLE
VICTOR
CORVALLIS
HAMILTON
DARBY
BITTERROOT RIVER
BITTERROOT RIVER
E. FORK
LEGEND
NATIONAL FOREST
SMALL PRIVATE
LARGE PRIVATE
STATE AND COUNTY
PUBLIC DOMAIN
Ownership as of 1940

THE PROBLEM OF ESTABLISHING THE PROPER KIND OF INDUSTRY

The type of lumber industry most beneficial to Ravalli County would be one that not only mills the local logs but remanufactures its products to a high degree, wherever this is possible. This kind of industry would make the maximum return to the people of the county.

At the present time, the bulk of the logs produced in Ravalli County are milled outside the county. In 1940, only 26 percent of the logs were milled within the county. Figure 11 shows this relative proportion of the Ravalli County log production milled outside the county. This condition can be expected to persist until the large private holdings are cut over which, at the present rate of cutting, will be within a few years.

Some 10 to 15 mills ordinarily operate within the county. As the privately owned resource of timber is further exhausted, a larger proportion of the cut will shift to the national forest. The present production of the county's mills has been from 10 to 15 million board feet of ponderosa pine lumber in recent years; since the allowable cut of national forest ponderosa pine is only 7½ million board feet, there must follow a reduction of production. It would seem desirable to concentrate the bulk of the annual cut in a few mills, thereby assuring more efficient manufacture on account of better and more complete equipment of larger mills as compared to the very small mills. This does not exclude the small mill if it is efficiently operated.

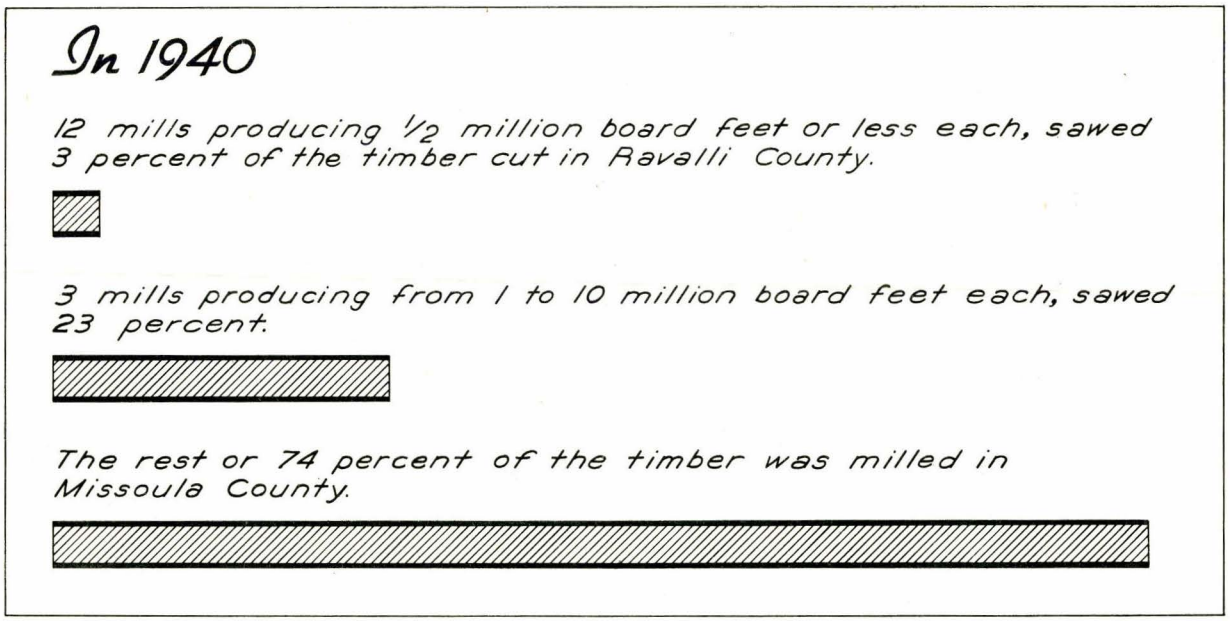
In 1940
12 mills producing ½ million board feet or less each, sawed 3 percent of the timber cut in Ravalli County.
3 mills producing from 1 to 10 million board feet each, sawed 23 percent.
The rest or 74 percent of the timber was milled in Missoula County.

Figure 11

The wages per thousand board feet of lumber cut tend to increase as the size of mill increases due to the higher degree of manufacture, greater utilization, and better markets. The table on this page shows the labor costs per thousand board feet of lumber cut by mill sizes for the Inland Empire Region. This shows the desirability of concentrating the production of lumber.

SIZE OF MILL AND LABOR COSTS
INLAND EMPIRE - 1939

Mills grouped by annual production - thousand board feet	Wages per thousand board feet of lumber cut
200- 499	$6.47
500- 999	7.91
1,000- 4,999	6.46
5,000- 9,999	10.45
10,000+	11.91

There are several possibilities for increasing the value of the local lumber products. The old growth ponderosa pine timber is excellent material for sash and door stock, box and crate material and also for various specialty articles. At present only one establishment in the county is manufacturing box material and making sash and doors. The large old growth ponderosa pine trees are also suitable for the manufacture of plywood. Ravalli County by itself does not have sufficient quantities of peeler logs to warrant establishment of a veneer plant, but a centrally located mill in western Montana could handle this material to the mutual advantage of Ravalli County and western Montana. The present considerable cut of Douglas-fir is largely consumed in the Butte mines. Efforts should be made to maintain or increase this market for Douglas-fir.

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OTHER MAJOR ASPECTS OF THE FOREST PROBLEM

The term "multiple use" is employed by forest land managers to express the idea that forest land can and should be utilized for such purposes as grazing, recreation and watershed protection while growing logs for the sawmill.

WATERSHEDS

One of the essential uses of Ravalli County's forest land is to yield water for the agricultural economy. As previously stated, agriculture is dependent upon the forest lands for irrigation water supplies. With the assessed valuation in 1942 1/ of $3,160,132 for irrigated lands, the forest watershed has an average value of $2.60 2/ per acre in dependent farm land values; hence, a primary value of much of the forest land is for watersheds essential to the agricultural industry. Fortunately, sound management for timber, grazing and recreation does not impair the use of the forest land for water production appreciably.

LIVESTOCK RANGE

Over one-half of Ravalli County's farm income is from livestock and livestock products; hence, the importance of the county's grasslands. In 1942, there were almost 30,000 head of cattle and horses and 20,000 sheep in the county. The national forest provided grazing for about 3,000 cattle and horses for a period of 5 months and some 8,000 head of sheep for 3½ months. In terms of yearlong maintenance of the county's livestock, the national forest supported 5 percent of the cattle and horses and 7 percent of the sheep.

A 1940 survey of the area outside the national forest boundaries shows that more than half of the land used for grazing is forest land.

	Acres
Forest	75,000
Dry grass range	61,000
Natural meadows	5,000
Total	141,000

Obviously, the forest range is an important factor to the local stock industry even though some of this range is of low-carrying capacity. For many of the local ranchers,

1/ State Board of Equalization - Tenth biennial report.
2/ Derived by dividing the assessed values indicated by the 1.2 million acres of forest land.

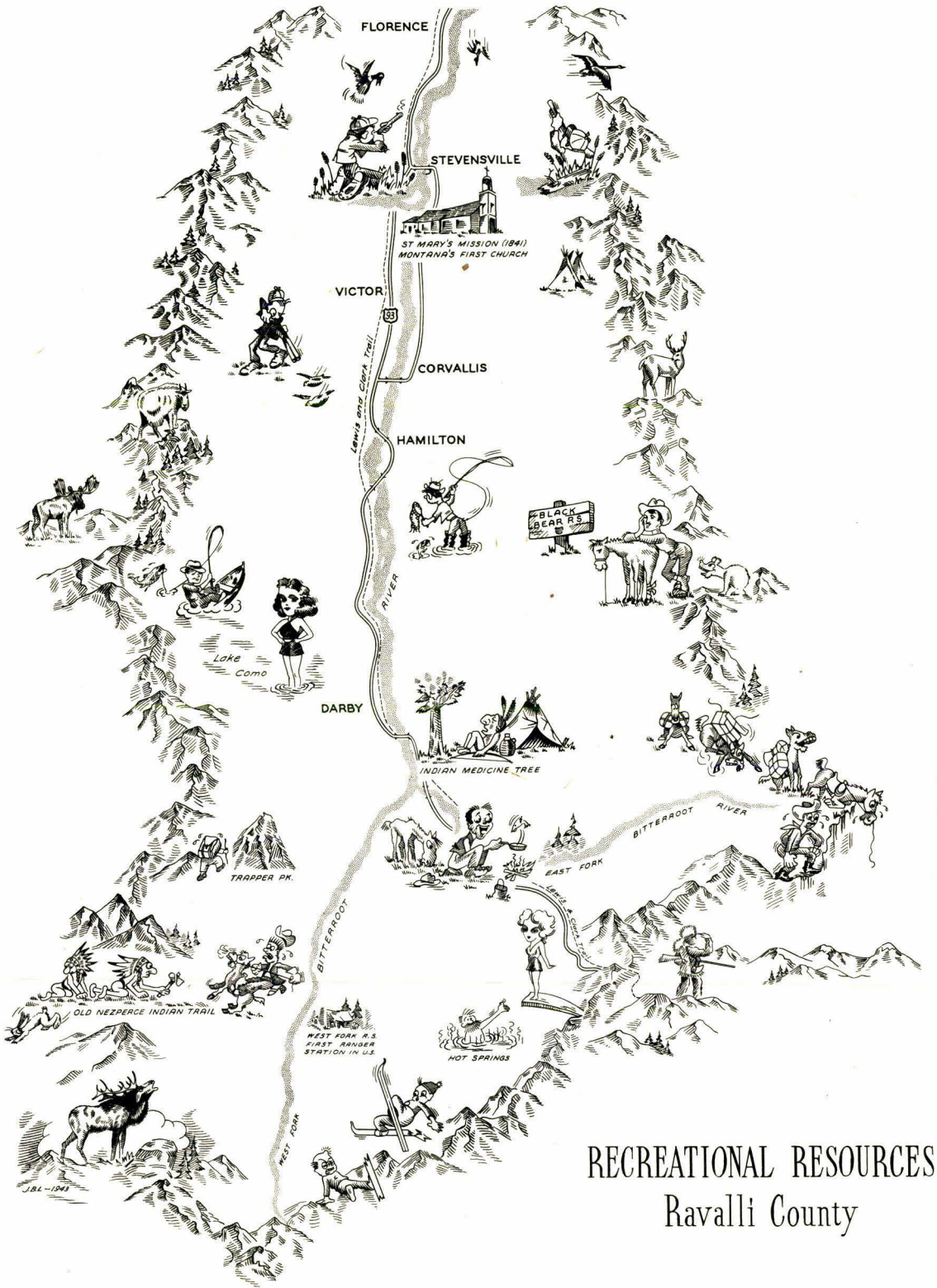
grass rather than trees is the crop which they value most. This primarily arises from the shortage of grazing capacity to handle adequately all of the livestock in the county.

Experimental seedings of crested wheat grass recently were made on clear-cut and badly burned areas of private forest land acquired by the Bitterroot National Forest. The results indicate that it is feasible to establish crested wheat grass on some burned-over forest areas. However, on these same areas pine seedlings established themselves right after the burn. Hence, this method appears to offer only a temporary solution. The biggest opportunity for increasing the supply of forage on a permanent basis lies in rehabilitating the large area of natural grassland, which in many cases is in a badly depleted condition, resulting from long continued overgrazing and faulty range management. The grazing survey mentioned on page 22 reports that some 70,000 acres of county and privately owned grazing land had declined 53 percent in carrying capacity because of exploitative land-use practices. However, the same survey data indicate that the present carrying capacity can be increased 115 percent by proper management practices. Fortunately, a number of landowners are taking steps to rehabilitate their range. This program, no doubt, will be aided by the recent establishment of a Soil Conservation district in the county.

Under extensive forest management, much of the forest land area in the county can be used simultaneously for grazing and timber production; however, management primarily for grazing values will sacrifice some or all of the timber values. This may be desirable when the grazing value received is worth the long-time loss in timber, but it would be unwise to convert high quality forest land into dry range or poor irrigated meadow. Intensive land classification is needed for intelligent planning in this regard.

RECREATION

There are few areas where such a profusion of recreational resources and advantages exist as are found in the Bitterroot Valley. The variety of wild life is unique. Big game animals include deer, elk, black bear, grizzly bear, moose, mountain goat and mountain sheep. The area along the Bitterroot River affords excellent duck hunting. Upland game birds include Chinese pheasants, Hungarian partridges and native grouse species. Fishing for trout and white fish may be enjoyed throughout most of the year while the high country of rugged peaks, mountain lakes, clear streams and green timber is a challenge to the hardy hiker. Pack trips for hunting or fishing or just relaxation are available. A number of hot springs occur in



RECREATIONAL RESOURCES
Ravalli County

the valley of which three have been developed for bathing. Gibbons Pass, elevation 6,995 feet and accessible by an all weather road, is renowned for its excellent skiing.

Colorful historic interest centers around such locations as the old St. Mary's Mission (still in use) at Stevensville, the old Nez Pierce trail leading to the scene of Magruder's massacre, the Lewis and Clark route and the Indian "medicine tree," a veteran ponderosa pine still standing just off the highway near the confluence of the East Fork and West Fork of the Bitterroot River.

As an industry, recreation now directly employs a number of persons, the majority of them only during the summer season. Indirectly, the returns from recreational activities are much greater. The patronage of local tourist facilities cannot be precisely established, but a heavy stream of vacationist traffic flows over U. S. Highway No. 93, up and down the valley. Local ranchers lease hunting rights on their ranches while tourists and sportsmen patronize local outfitters of clothes and equipment.

The use of Ravalli County's recreational resource need have no deleterious effect on other land uses. Actually, over half of the forest land is not suited to commercial timber use but contains superlative advantages for the recreationist. Recognizing these values the national forest has reserved about one-half of this noncommercial land for recreation and watershed use exclusively. The accessibility of this valley promises to build up a recreation industry of increasing importance.

UNECONOMIC LAND USE

Uneconomic agricultural land use is another factor in the land-use problem. Ordinarily, land must come up to certain minimum standards in order to make private ownership feasible and desirable. Undesirable rural settlement occurs when the returns from farms or stump ranches plus the income from outside employment cannot and are not likely to provide a reasonable standard of living or when the settlement is so scattered that the costs of schools, roads and other public services are out of line with the income-producing capacity of the land.1/

The per capita costs of public services are generally not

1/ State Legislation for Better Land Use. U.S.D.A. Special Report - 1941.

directly but inversely proportional to the number of people served. For instance, it costs as much to keep a road open for one family as it does for ten families; hence, the increasing cost per person with a decreasing population density.

Land abuse is one of the prices paid for the almost complete freedom the individual enjoys in land use. Land zoning has been employed in some states as a basic remedy to correct abuses. Under this method the land is classified according to probable best use. Lands classified as submarginal for specific uses becoming tax delinquent are not allowed to pass back into private ownership. Then as a submarginal area becomes almost depopulated the local government may eventually buy out the remaining inhabitants in order to save the costs of maintaining improvements. However, in order to provide a true solution, the shifting of inhabitants from such submarginal lands is not complete until they are relocated in more favorable surroundings; otherwise they may create problem areas elsewhere. So far, Montana has not seen fit to pass a law enabling counties to carry out land zoning.

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A COURSE OF ACTION FOR RAVALLI COUNTY

The responsibility for improving Ravalli County's social and economic condition is shared by all agencies and inhabitants of the county. The industries and resources of the county are so closely allied and integrated that they must all be considered in developing a sound basis for a secure and workable economy for the Bitterroot Valley.

AGRICULTURE

Agriculture is the most important basic industry and supports two-thirds of the population; from 1930 to 1935 the number of farms increased 16 percent; however, the number of farms have been almost constant since then. Farming and ranching promise to continue to be the primary industry. Furthermore, the agricultural resource can be permanently and materially developed in a relatively short time while the forest resource can be built up slowly. The range improvement measures and soil conservation work now under way are steps in the right direction and should be applied generally throughout the area. An intensive land-use classification program should be carried out to provide comprehensive information for sound land management.

RECREATION

Recreational development is not being carried on during the present emergency. Curtailment of gasoline consumption, tires and sporting equipment temporarily will decrease recreational activities. However, with the resumption of peace-time activities, recreation use can be expected to increase and surpass all previous records. The mounting trend toward outdoor recreation will require ever increasing development of the natural resources to satisfy the vacationists' demand.

Increasing use intensifies the problems of protecting the recreational resources. The national forest policy is to retain strips of timber along traveled roads in order to conserve the scenic beauty along these roads. Developments that would change the character of the wilderness and wild areas dedicated to recreational use are held to a minimum. The Federal Highway Act of 1940 provides for purchase of strips of land paralleling highways to conserve the natural beauty.

Advertising and promotional work will secure wider use of the resources and build up the recreation industry. This work is best carried out by local civic groups. An

association of establishments serving the recreational demand is desirable with registration of facilities meeting minimum requirements. In this way, the message of vacation advantages could be given wider circulation at less cost than could be attained through individual initiative.

FORESTRY

The forest ownership of Ravalli County is settling into two major classes: one is the farmer and small timberland owner, the other is the public agencies. The necessary changes and development work will largely be carried out by these two classes of owners. The era of harvesting timber without replacing it is about over.

The Farmer and Small Timberland Owner in Ravalli County

The large logging operations of Ravalli County are passing out of the picture. A few more years at the best will see the completion of the present large-scale operations. The alternatives then confronting the county is whether to leave the timber industry shift for itself with a resulting sporadic and haphazard production or whether to integrate the timber, agricultural and grazing resources in order to develop the forest resource and bring a continuing contribution to the valley's economy.

The opportunity for a sound forest policy rests rather squarely on the Ravalli County farmers and resident timberland owners. Other owners and agencies have a definite contribution to be made toward a constructive forest policy, but the local resident now cultivating his land is the real backbone of Ravalli County, not only from the standpoint of timber production but from almost every basic consideration.

Statistics - The forest statistics show the bright possibilities for a new era of forestry and timber production in this area. To begin with, small private owners hold 30 percent of all commercial ponderosa pine land. This land is, in general, the most accessible area and also comprises the better sites. Seventy percent of the best site class of ponderosa pine in Ravalli County (Site III) and 79 percent of all ponderosa pine pole stands is in small private ownership.

The small private ownership picture of the ponderosa pine looks like this:

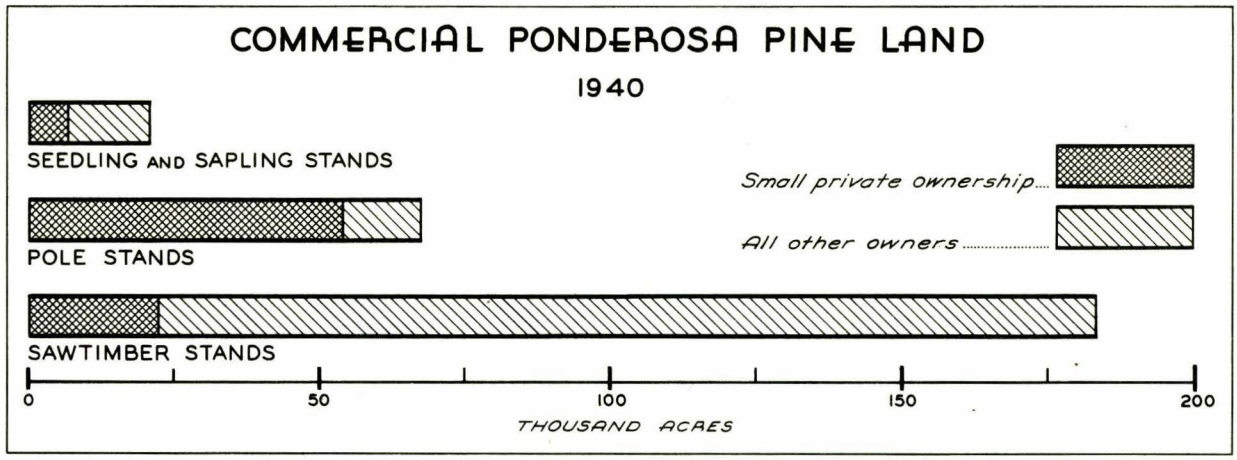

Figure 12

The fact that the small private ownership of ponderosa pine land consists predominantly of pole stands limits the amount of material that can be marketed at the present time but provides good thrifty growing stands that will respond to intensive management. Besides the 82.6 thousand acres of ponderosa pine land in small private ownership, there are some 18 thousand acres of other types.

Stocking of the ponderosa pine stands is relatively good. Considering only the volume in trees 11.1 inches d.b.h. and over, the saw-timber stands contain an average of 5,000 board feet, Scribner rule, per acre and pole, seedling and sapling stands an average of 1,200 board feet per acre.

Advantages of the Farm Forests[1/] - A number of advantages are inherent in the farm ownership of timberland. Some of the most obvious are the following:

1. The farm timberland offers off-season employment to the farm operator since practically all woods operations can be carried on when other farm work is slack. Better than any other forest owner the farmer can log, prune, thin, salvage for fuel and dispose of slash during the winter season. Idle horses and equipment may be used in these woods operations.

1/ For a detailed discussion of the farm woodland problem in western Montana the reader is referred to I. V. Anderson's "The Farm Woodlot," Montana State University Bulletin, No. 367, 1939.

2. By pruning and thinning, the owner not only improves the quality of the timber crop and supplies his needs for fuel and other wood requirements, but at the same time improves grazing values by letting more light into the stands.

3. Under reasonably intensive management, yields will equal or surpass potential mean annual growth in these stands. Current net growth on the ponderosa pine lands in small private ownership is over four million board feet annually. Potential yield is almost ten million board feet. This potential yield is based on reasonably good distribution of age classes of medium to good stocking on all lands. In addition to the growth of ponderosa pine, other conifer types (mainly Douglas-fir) will yield another one million board feet annually while the 8,600 acres of cottonwood will produce from one-half to one million board feet.

4. Fire hazard and protection costs are relatively low since utilization and slash disposal are practically complete.

5. Losses from insects and other mortality factors are practically eliminated since trees may be logged at any time in these accessible farm forests.

6. Markets permitting, the farm owner is in a position to harvest special crops such as Christmas trees, mine timbers or posts whenever the stand requires this treatment.

7. Finally, there is the pride of good land use and the feeling of security attained by the owner who manages his timberland for high returns on a sustained basis.

The Marketing Problem - The farm owner is seldom in an advantageous position for selling his forest products. Timber products are ordinarily sold on a buyers' market. The drawbacks to the marketing problem can be largely alleviated by cooperative marketing. In other regions the practice of small owners pooling their farm products has led to tremendously increased returns to the members of the pool. The cooperative is in a much better position than an individual for selling farm products. The same premise holds for forest crops as well. The pool permits quantities sufficiently large to interest the bigger mills; also, grading of logs and other products is much more feasible than when the individual sells a limited quantity. A pool

increases the chances for a steady flow of products. The larger mills, almost without exception, are eager and willing to buy logs to supplement their own logging. Since the advantages of the bigger mills are many, it is obvious that the members of the pool benefit from higher prices made possible by better markets, more efficient milling and greater remanufacture.

Once a pool is established it also has the advantage of buying supplies for its members with the resultant savings achieved by buying in quantity directly from sources of supply. Cooperatives of this type are not at all new. The principle is old and proven; the idea of selling forest products cooperatively is of more recent origin but entirely feasible.

If the local residents wish to market lumber or produce lumber for their own needs, a cooperative sawmill may be established. Such a mill was built by the farmers in Flathead County with help from the Farm Security Administration. They found that 60 percent of the cost of running the mill was labor cost; hence, lumber for farm use costs only a fraction of the usual market cost. A cooperative might want to own special logging machinery for use by its members.

Technical Assistance - Technical advice needed and desired by timberland owners can be furnished by the Forest Service, Soil Conservation Service and county agent. Good forest management on these lands is not difficult. Actually past experience of other timber selling cooperatives indicates that often the advantages were so great that there was a tendency to overcut stands, thus impairing their capacity for sustained yield.

The Large Timberland Owners

The discussion so far has been primarily concerned with the small owner. Other agencies and owners have a definite responsibility toward the local residents and industries. The big time timber operations of the past are just about finished in Ravalli County; whether they were good or bad, wise or unwise, makes little difference now and is just water over the dam; however, there is a lot of timber left in the valley, even if not adapted to large scale operations. The national forest alone has extensive stands that are ready to meet the need for saw timber in the years to come. The Forest Service is committed to a policy of contributing to the local economy in every way possible through a sound timber management policy and can furnish annually under sustained-yield management approximately 7½ million board feet of ponderosa pine.

Besides furnishing timber for a lumber industry, the national forest furnishes employment for about 70 men, most of them on a part-time basis. A program is ready for performing desirable developmental work on the national forest that will about double this employment. With the appropriation of necessary funds this program proposes such work as road construction for utilization and access of timber stands; reforestation of nonstocked forest land; training and equipping fire suppression crews; reduction of fire hazards; improvement and construction of telephone lines, lookout towers, campgrounds, etc; engineering surveys for water storage facilities; improving grazing access in the down timber areas; and developing recreation resources through wild life administration studies, winter game counts and fish planting and propagation.

Cooperation between all owners and agencies for the mutual betterment of the people concerned will go far in bringing the county's forests into maximum production.

GOING AHEAD

Plenty of hard work lies ahead in managing the natural resources to contribute the most to the permanent welfare of the residents of Ravalli County.

A temporary curtailment of the logging and lumbering industry is inevitable, but the forest resource is not exhausted and can be managed so as to make increasing contribution to the local economy. Farming and grazing will continue to make up the backbone of the valley's economy; the watersheds are intact; the irrigation development is increasing and only a beginning has been made in storing water for growing crops. The ranges, although impaired, can be restored to their former productivity and some ranchers have made notable accomplishments in this phase of rehabilitation. The future of the recreation industry has hardly been visualized as yet, but the resources in the form of fish and game, streams and lakes, mountains and valley are all present and waiting to be put to use.

Good land management including good forest management is fundamental in attaining the objective of improved living conditions in the Bitterroot Valley and to stimulate a new appreciation of the land as a way of life that provides contentment, satisfaction and security.

The basic resources, although partially depleted, are renewable and can be built up through intelligent cooperative planning so that the valley will continue to merit the claim of the "best place to live in Montana."

A P P E N D I X

EXPLANATION OF TERMS USED IN WESTERN MONTANA TABLES

Forest Land

Land available and suitable for growing forest trees regardless of their quality or accessibility.

Commercial Forest Land

Forest land now bearing commercial timber or suitable for commercial timber production.

NONRESERVED COMMERCIAL FOREST LAND

Commercial forest land not reserved for specific purposes other than timber production.

Stocked Commercial Forest Land

Areas with 3 or 4 thousand board feet (depending on forest type) of saw timber per acre, or areas that are more than 10 percent stocked with poles, seedlings or saplings.

Forest Types

Stocked commercial stands are grouped into ten different forest types as follows:

Western white pine - Stands in which western white pine constitutes 15 percent or more of the total net cubic volume. This type is given priority over all others. The minimum volume for a saw-timber stand is 4 thousand board feet per acre.

Ponderosa pine - Stands in which ponderosa pine constitutes 25 percent or more of the total net cubic volume. This type is given priority over all except white pine. The minimum volume for a saw-timber stand is 3 thousand board feet per acre.

Larch-Douglas fir - Stands in which larch and Douglas-fir constitute 75 percent or more of the total net cubic volume. At least 10 percent of the total volume is larch. The minimum volume for a saw-timber stand is 4 thousand board feet per acre.

Hemlock-grand fir - Stands in which hemlock and grand fir, either separately or combined, constitute 50 percent or more of the total net cubic volume. The minimum volume for a saw-timber stand is 4 thousand board feet per acre.

Douglas-fir - Stands in which Douglas-fir constitutes 60 percent or more of the total net cubic volume. The minimum volume for a saw-timber stand is 4 thousand board feet per acre.

Engelmann spruce - Stands in which Engelmann spruce constitutes 50 percent or more of the total net cubic volume. The minimum volume for a saw-timber stand is 4 thousand board feet per acre.

Lodgepole pine - Stands in which lodgepole pine constitutes 50 percent or more of the total net cubic volume. The minimum volume for a saw-timber stand is 3 thousand board feet per acre.

Western redcedar - Stands in which western redcedar constitutes 50 percent or more of the total net cubic volume. The minimum volume for a saw-timber stand is 4 thousand board feet per acre or 8 cedar poles per acre.

Cedar-grand fir - Stands in which western redcedar and grand fir, either separately or combined, constitute 50 percent or more of the total net cubic volume. The minimum volume for a saw-timber stand is 4 thousand board feet per acre or 8 cedar poles per acre.

Cottonwood - Stands in which northern black cottonwood constitutes 50 percent or more of the total net cubic volume. The minimum volume for a saw-timber stand is generally 4 thousand board feet per acre.

Stand Class

Stocked commercial stands are grouped into three size classes according to the size of trees predominating. These classes are:

Saw-timber stands - Stands in which a plurality of the total net cubic volume is in trees of saw-timber size and that average 3 or 4 thousand board feet of saw-timber volume per acre, excluding cedar poles. White pine, ponderosa pine, lodgepole pine, western redcedar, and cottonwood trees 11 inches in diameter and larger at breast height are classed as saw timber. For the other species, trees 13 inches and larger are classed as saw timber.

Pole stands - Stands in which a plurality of the total net cubic volume is in trees from 5 inches in diameter to saw-timber size.

Seedling and sapling stands - Stands in which a plurality of the total net cubic volume is in trees less than 5 inches in diameter.

Cutting Condition

Stocked commercial forest stands are grouped into three classes according to the stand condition due to cutting or absence of cutting. These classes are:

Uncut - Saw-timber stands in which logging reduced the original volume less than 10 percent and pole, seedling and sapling stands following fire that was not preceded by logging.

Partially cut - Saw-timber stands in which logging reduced the original volume 10 percent or more but which at time of mapping averaged at least 3 or 4 thousand board feet per acre.

Cut - Pole, seedling and sapling stands following cutting where the residual volume in saw-timber trees is less than 3 or 4 thousand board feet per acre.

Age Class

Stocked commercial stands are grouped into age classes of 20-year periods for stands of average ages of 160 years or less. Stands with an average age of 161 to 200 years are grouped into one class, and all stands with average ages of over 200 years are classified into that age class.

Site Class

Commercial forest land is classified according to its productive capacity. This capacity is determined by the average height of the dominant and codominant trees in a stand in relation to their age. In use, the commercial forest land is divided into five or six site classes (depending on species) in which Site I represents the best and Site VI the poorest land for growing commercial timber.

Nonstocked Commercial Forest Land

Nonstocked commercial forest land is classified according to the causative agency responsible for the nonstocked condition into the following two classes:

Nonrestocked cutover - Unimproved logged areas which, at the date of mapping, averaged less than 3 or 4 thousand board feet per acre and less than 10 percent stocked with poles and/or seedlings and saplings.

Nonrestocked burn - Unimproved lands deforested by fire which, at the date of mapping, averaged less than 3 or 4 thousand board feet per acre and less than 10 percent stocked with poles and/or seedlings and saplings.

RESERVED COMMERCIAL FOREST LAND

Reserved commercial forest land is of the same commercial characteristics as nonreserved commercial forest land; hence, the same classifications apply in both cases. Reserved commercial forest land is dedicated to specific purposes other than commercial timber production and is therefore not available for timber use.

Noncommercial Forest Land

Forest land of such low productivity, rugged terrain, or extreme inaccessibility that it appears to be permanently out of the commercial timber-producing class is classed as noncommercial forest land. This type of forest land is classified in two categories according to use as follows:

NONRESERVED NONCOMMERCIAL FOREST LAND

Nonreserved noncommercial forest land is not reserved for any specific purpose.

RESERVED NONCOMMERCIAL FOREST LAND

Reserved noncommercial forest land is reserved for some specific purpose such as recreation, watershed protection, etc.

Nonforest Land

Lands not suited primarily to growing trees and forest lands converted to and permanently maintained in some use other than timber production are grouped into the following classes:

Cultivated, pasture, and grass - Lands utilized for agricultural crops, permanent and improved pastures, and natural grasslands including sage brush areas having a definite forage value.

Townsites - Areas included in the corporate limits of cities.

Brush - Areas of a permanent brush type not including areas of brush resulting from burning, cutting, or clearing.

Barren - Areas too rocky or too exposed to support a vegetative cover of either trees, shrubs, or herbs.

Classes of Land Ownership

Large private - This class includes the land area of the five largest holders of land in western Montana.

Small private - This class includes the land area held by all other private owners.

State - The land area owned by the State of Montana.

County - The land area owned by the several counties.

Indian - The land area held in trust for Indians.

Public domain - Federal land area unreserved for any special purpose.

National park - Federal land area managed by the Park Service of the Department of Interior.

Other federal - (1) Military reservations, and (2) land area managed by the Wildlife Service of the Department of Interior.

National forest - Federal land area managed by the Forest Service of the Department of Agriculture.

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Table 1. - Land area by land use and ownership, 1940

Land use	National forest	All other owners	Total
	---------- Thousand acres ----------		
Forest:			
Commercial	353.6	190.6	544.2
Noncommercial	680.5	11.1	691.6
Total forest	1,034.1	201.7	1,235.8
Nonforest:			
Cultivated, pasture, & grass	15.4	252.1	267.5
Townsites		1.2	1.2
Brush	1.9	5.0	6.9
Barren	15.5	.1	15.6
Total nonforest	32.8	258.4	291.2
Total all uses	1,066.9	460.1	1,527.0

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Table 2. - Forest land area by ownership and broad commercial classes, 1940

Ownership class	Noncommercial forest land			Commercial forest land 3/	Total forest land
	Chiefly valuable for purposes other than timber production 1/	Reserved from cutting 2/	Total		
	Thousand Acres				
Large private	3.8		3.8	54.1	57.9
Small private	4.3		4.3	102.9	107.2
State	.7		.7	20.9	21.6
County	.1		.1	2.8	2.9
Public domain	2.2		2.2	9.9	12.1
Total	11.1		11.1	190.6	201.7
National forest	649.3	31.2	680.5	353.6	1,034.1
Total all classes	660.4	31.2	691.6	544.2	1,235.8

1/ Consists of subalpine and other forest land which because of low productivity or extreme inaccessibility appears to be permanently out of the commercial timber-producing class.
2/ Land capable of producing commercial timber and economically accessible, now or prospectively, but reserved from cutting.
3/ Land capable of producing commercial timber and economically accessible, now or prospectively, and not reserved from cutting.

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Table 3. - Commercial forest land[1] by forest type, stand class, and ownership, 1940

Forest type and stand class[2]	Large private	Small private	State	County	Public domain	Total	National forest	Total all ownerships
	Thousand Acres							
Ponderosa pine								
Saw timber	28.9	22.4	15.2	1.2	3.4	71.1	113.1	184.2
Pole	1.4	53.2	2.1	.6	.9	58.2	9.0	67.2
Seedling & sapling	2.3	7.0	.8	.3	.8	11.2	10.3	21.5
Total	32.6	82.6	18.1	2.1	5.1	140.5	132.4	272.9
Larch-Douglas fir								
Saw timber	.4	.7	.2	.1	1.3	2.7	2.7	5.4
Pole	.9	.4	.1		.2	1.6	2.5	4.1
Seedling & sapling		.2			.2	.4	.6	1.0
Total	1.3	1.3	.3	.1	1.7	4.7	5.8	10.5
Douglas-fir								
Saw timber	6.3	1.2	.9			8.4	39.3	47.7
Pole	5.7	4.8	.6	.1	1.2	12.4	72.4	84.8
Seedling & sapling	.2	1.0	.2	.4		1.8	3.3	5.1
Total	12.2	7.0	1.7	.5	1.2	22.6	115.0	137.6
Engelmann spruce								
Saw timber	.1	.1				.2	4.8	5.0
Pole								
Seedling & sapling								
Total	.1	.1				.2	4.8	5.0
Lodgepole pine								
Saw timber							2.2	2.2
Pole	6.4	.6	.6		.6	8.2	69.0	77.2
Seedling & sapling	.4	1.0			.1	1.5	18.9	20.4
Total	6.8	1.6	.6		.7	9.7	90.1	99.8
Cottonwood								
Saw timber	.1	3.2				3.3		3.3
Pole, seedling & sapling	.1	5.4			.2	5.7	.1	5.8
Total	.2	8.6			.2	9.0	.1	9.1
All stocked types								
Saw timber	35.8	27.6	16.3	1.3	4.7	85.7	162.1	247.8
Pole[3]	14.5	64.4	3.4	.7	3.1	86.1	153.0	239.1
Seedling & sapling	2.9	9.2	1.0	.7	1.1	14.9	33.1	48.0
Total	53.2	101.2	20.7	2.7	8.9	186.7	348.2	534.9
Nonstocked burns	.1	.1	.1		.7	1.0	3.2	4.2
Nonstocked cutovers[4]	.8	1.6	.1	.1	.3	2.9	2.2	5.1
Total	.9	1.7	.2	.1	1.0	3.9	5.4	9.3
Grand total	54.1	102.9	20.9	2.8	9.9	190.6	353.6	544.2

1/ Land capable of producing commercial timber and economically accessible, now or prospectively, and not reserved from cutting.
2/ For definition of forest types and stand classes, see "Explanation of Terms Used in Ravalli County Report," pages 33 to 37.
3/ Includes all nonsaw-timber cottonwood stands.
4/ Includes some cutover area for which the condition of forest cover is undetermined and of which some is stocked.

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Table 3a. - Stocked commercial forest land[1] for certain forest types by ownership and cutting condition, 1940

Forest type	Large private	Small private	State	County	Public domain	Total	National forest	Total all ownerships
	Thousand Acres							
Ponderosa pine								
Saw timber								
Partially cut	1.5	6.4	0.7	0.1	0.4	9.1	6.4	15.5
Uncut	27.4	16.0	14.5	1.1	3.0	62.0	106.7	168.7
Pole, seedling & sapling								
Cut	3.5	57.6	2.5	.8	1.3	65.7	17.6	83.3
Uncut	.2	2.6	.4	.1	.4	3.7	1.7	5.4
All other types								
Saw timber								
Partially cut		.1				.1		.1
Uncut	6.9	5.1	1.1	.1	1.3	14.5	49.0	63.5
Pole, seedling & sapling								
Cut	3.5	4.8	.3	.4	.2	9.2	5.0	14.2
Uncut	10.2	8.6	1.2	.1	2.3	22.4	161.8	184.2
Total all types								
Saw timber								
Partially cut	1.5	6.5	.7	.1	.4	9.2	6.4	15.6
Uncut	34.3	21.1	15.6	1.2	4.3	76.5	155.7	232.2
Pole, seedling & sapling								
Cut	7.0	62.4	2.8	1.2	1.5	74.9	22.6	97.5
Uncut	10.4	11.2	1.6	.2	2.7	26.1	163.5	189.6

1/ Land capable of producing commercial timber and economically accessible, now or prospectively, and not reserved from cutting.

In the above table the forest types on cutover areas are based on the stand composition after logging. Partially-cut saw-timber stands have been cut over but still meet the minimum requirements for a saw-timber stand. Cutover saw-timber stands that do not meet this minimum are classified either as cut pole, seedling and sapling stands or are carried in the preceding table as nonstocked cutovers. Uncut pole, seedling and sapling stands have usually followed fire.

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Table 4. - Commercial coniferous[1] forest land[2] by age, forest type, and ownership, 1940

BY FOREST TYPE

Forest type and ownership class	Non-stocked[3]	Age class - years										Total
		1-20	21-40	41-60	61-80	81-100	101-120	121-140	141-160	161-200	200+	
	Thousand Acres											
Ponderosa pine	7.2	9.6	22.2	46.9	5.2	6.7		5.9	6.6	26.4	143.4	280.1
Larch-Douglas fir		.1	.9	.3	.8	.6		2.1	2.5	2.4	.8	10.5
Douglas-fir	1.9	.6	6.3	9.5	11.1	10.1	20.7	23.3	26.3	26.3	3.4	139.5
Engelmann spruce								.2	1.0	3.6	.2	5.0
Lodgepole pine	.2	5.4	14.4	14.7	8.4	11.4	15.7	26.2	1.4	.1	2.1	100.0
Total	9.3	15.7	43.8	71.4	25.5	28.8	36.4	57.7	37.8	58.8	149.9	535.1
BY OWNERSHIP CLASS												
Large private	.9	.9	2.7	4.4	.8	.8	5.5	2.5	7.8	3.8	23.8	53.9
Small private	1.7	5.4	12.4	38.2	5.7	6.6	.3	3.5	3.4	4.5	12.6	94.3
State	.2	.5	1.2	1.6	.2	.3	.4	1.1	1.1	.9	13.4	20.9
County	.1	.3	.5	.5		.1	.1		.1	.3	.8	2.8
Public domain	1.0	.2	1.0	1.9	.5	.1	.1	.4	1.3	.9	2.3	9.7
Total	3.9	7.3	17.8	46.6	7.2	7.9	6.4	7.5	13.7	10.4	52.9	181.6
National forest	5.4	8.4	26.0	24.8	18.3	20.9	30.0	50.2	24.1	48.4	97.0	353.5
Total all classes	9.3	15.7	43.8	71.4	25.5	28.8	36.4	57.7	37.8	58.8	149.9	535.1

1/ The cottonwood type amounting to 9.1 M acres was not classified as to age and is not included in this table.
2/ Land capable of producing commercial timber and economically accessible, now or prospectively, and not reserved from cutting.
3/ Includes some cutover area for which the condition of forest cover is undetermined and of which some is stocked.

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Table 5. - Saw-timber volume (Scribner log scale) on commercial forest land[1] by species and ownership, 1940

Ownership class	Area of stands	Ponderosa pine	Western larch	Douglas-fir	Alpine fir[2]	Western red-cedar[3]	Engelmann spruce	Lodgepole pine[4]	Black cotton-wood[5]	Total	Cedar poles
	Thousand acres	Million board feet[6]									Thousand pieces
SAW-TIMBER STANDS											
Large private	35.8	194.7	1.6	86.5	0.1		2.9	3.0	0.6	289.4	0.1
Small private	27.6	111.1	2.1	27.9			.7	.8	16.6	159.2	.1
State	16.3	115.6	.7	27.4			.5	.4		144.6	
County	1.3	6.3	.2	1.4					.1	8.0	
Public domain	4.7	19.6	4.4	6.2			.1	.3		30.6	
Total	85.7	447.3	9.0	149.4	.1		4.2	4.5	17.3	631.8	.2
National forest	162.1	673.6	11.0	379.6	13.9		30.9	26.8	.1	1,135.9	.1
Total all classes	247.8	1,120.9	20.0	529.0	14.0		35.1	31.3	17.4	1,767.7	.3
POLE, SEEDLING AND SAPLING STANDS											
Large private	17.4	4.6	.8	13.0	.8		1.3	5.8	.1	26.4	
Small private	73.6	73.1	.8	11.1	.1		.1	2.2	5.9	93.3	
State	4.4	3.0	.1	2.1	.1		.1	.4	.1	5.9	
County	1.4	.6		.5						1.1	
Public domain	4.2	2.2	.4	1.2				.3	.1	4.2	
Total	101.0	83.5	2.1	27.9	1.0		1.5	8.7	6.2	130.9	
National forest	186.1	33.5	3.0	130.2	8.9		7.0	53.6	.6	236.8	
Total all classes	287.1	117.0	5.1	158.1	9.9		8.5	62.3	6.8	367.7	
Grand total all stands	534.9	1,237.9	25.1	687.1	23.9		43.6	93.6	24.2	2,135.4	.3

1/ Land capable of producing commercial timber and economically accessible, now or prospectively, and not reserved from cutting.
2/ Includes approximately 0.3 million board feet of grand fir.
3/ The volume of western redcedar, including the cedar poles shown in the last column (180 board feet per piece in saw-timber stands, 50 board feet per piece in pole, seedling and sapling stands) is too small to show.
4/ Includes approximately 0.2 million board feet of white bark pine.
5/ Includes approximately 0.6 million board feet of golden aspen.
6/ Includes the utilizable volume of all pine trees and western redcedar and hardwood trees larger than 11.0 inches d.b.h. and of all other trees larger than 13.0 inches d.b.h.

Included above is the immediately loggable volume plus the volume which is expected to become economically loggable at some future date.

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Table 6. - Saw-timber volume (Scribner log scale) on commercial forest land[1] by species and forest type, 1940

Forest type	Area of stands	Ponderosa pine	Western larch	Douglas-fir	Alpine fir[2]	Western red-cedar[3]	Engelmann spruce	Lodgepole pine[4]	Black cotton-wood[5]	Total	Cedar poles
	Thousand acres	Million board feet[6]									Thousand pieces
SAW-TIMBER STANDS											
Ponderosa pine	184.2	1,097.4	4.5	274.6	0.2		2.6	3.6	4.3	1,387.2	0.3
Larch-Douglas fir	5.4	1.8	14.2	13.5	.7		.3	2.2		32.7	
Douglas-fir	47.7	19.8	1.0	236.2	4.3		7.6	18.7		287.6	
Engelmann spruce	5.0	.7	.3	4.6	7.0		23.5	2.7		38.8	
Lodgepole pine	2.2			.1	1.8		1.1	4.1		7.1	
Black cottonwood	3.3	1.2							13.1	14.3	
Total	247.8	1,120.9	20.0	529.0	14.0		35.1	31.3	17.4	1,767.7	.3
POLE, SEEDLING AND SAPLING STANDS											
Ponderosa pine	88.7	94.1	.2	7.3			.2	2.0	6.5	110.3	
Larch-Douglas fir	5.1	1.4	4.9	6.8	.1			.7		13.9	
Douglas-fir	89.9	16.3		121.7	2.0		1.2	8.1		149.3	
Engelmann spruce											
Lodgepole pine	97.6	4.6		22.3	7.8		7.1	51.5		93.3	
Black cottonwood	5.8	.6							.3	.9	
Total	287.1	117.0	5.1	158.1	9.9		8.5	62.3	6.8	367.7	
Total all stands	534.9	1,237.9	25.1	687.1	23.9		43.6	93.6	24.2	2,135.4	.3

1/ Land capable of producing commercial timber and economically accessible, now or prospectively, and not reserved from cutting.
2/ Includes approximately 0.3 million board feet of grand fir.
3/ The volume of western redcedar, including the cedar poles shown in the last column (180 board feet per piece in saw-timber stands, 50 board feet per piece in pole, seedling and sapling stands) is too small to show.
4/ Includes approximately 0.2 million board feet of white bark pine.
5/ Includes approximately 0.6 million board feet of golden aspen.
6/ Includes utilizable volume of all pine trees and western redcedar and hardwood trees larger than 11.0 inches d.b.h. and of all other trees larger than 13.0 inches d.b.h.

Included above is the immediately loggable volume plus the volume which is expected to become economically loggable at some future date.

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Table 7. - Cubic volume[1] on commercial forest land[2] by species, tree size, and stand class, 1940

Species	Saw-timber stands			Pole stands			Seedling and sapling stands			All stands		
	Saw-timber trees[3]	Cordwood trees[4]	Total	Saw-timber trees[3]	Cordwood trees[4]	Total	Saw-timber trees[3]	Cordwood trees[4]	Total	Saw-timber trees[3]	Cordwood trees[4]	Total
	Million cubic feet											
Ponderosa pine	183.8	11.0	194.8	17.2	15.8	33.0	2.0	2.4	4.4	203.0	29.2	232.2
Western larch	3.6	.1	3.7	.8	1.1	1.9	.1	.2	.3	4.5	1.4	5.9
Douglas-fir	98.0	25.4	123.4	28.1	44.8	72.9	1.1	1.8	2.9	127.2	72.0	199.2
Alpine fir	2.7	.7	3.4	2.0	1.7	3.7		.1	.1	4.7	2.5	7.2
Western redcedar[5]												
Engelmann spruce	6.4	.8	7.2	1.5	1.0	2.5	.1		.1	8.0	1.8	9.8
Lodgepole pine	6.1	1.6	7.7	12.1	18.8	30.9	.1	.5	.6	18.3	20.9	39.2
Black cottonwood	4.6	.2	4.8	1.6	2.9	4.5	.1	.6	.7	6.3	3.7	10.0
Total	305.2	39.8	345.0	63.3	86.1	149.4	3.5	5.6	9.1	372.0	131.5	503.5

1/ The sound volume to a 4-inch top exclusive of bark of all trees larger than 5.0 inches d.b.h. including the stem only of coniferous trees and stem and limbs of hardwood trees.
2/ Land capable of producing commercial timber and economically accessible, now or prospectively, and not reserved from cutting.
3/ Includes utilizable volume of all pine trees and western redcedar and hardwood trees larger than 11.0 inches d.b.h. and of all other trees larger than 13.0 inches d.b.h.
4/ Sound trees more than 5.0 inches d.b.h. but less than saw-timber size.
5/ The volume of western redcedar is negligible.

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Table 8. - Current annual increment (Scribner log scale) on commercial forest land[1/] by species, stand class, and ownership, 1940

Species	National forest			All other owners			Total all owners		
	Saw timber	Pole, seedling and sapling	Total	Saw timber	Pole, seedling and sapling	Total	Saw timber	Pole, seedling and sapling	Total
	Million board feet								
Ponderosa pine	1.8	0.5	2.3	1.6	3.2	4.8	3.4	3.7	7.1
Western larch	.1	.1	.2	.1		.1	.2	.1	.3
Douglas-fir	1.0	1.9	2.9	.6	.5	1.1	1.6	2.4	4.0
Alpine fir	.1	.1	.2				.1	.1	.2
Western redcedar[2/]									
Engelmann spruce	.1	.1	.2				.1	.1	.2
Lodgepole pine	.1	.8	.9		.3	.3	.1	1.1	1.2
Black cottonwood				.1		.1	.1		.1
Total	3.2	3.5	6.7	2.4	4.0	6.4	5.6	7.5	13.1

1/ Land capable of producing commercial timber and economically accessible, now or prospectively, and not reserved from cutting.
2/ The volume of western redcedar is negligible.

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Table 9. - Current annual increment on commercial forest land[1/] by species, stand class, and ownership, 1940

Species	National forest			All other owners			Total all owners		
	Saw timber	Pole, seedling and sapling	Total	Saw timber	Pole, seedling and sapling	Total	Saw timber	Pole, seedling and sapling	Total
	Million cubic feet								
Ponderosa pine	0.2	0.3	0.5	0.2	0.9	1.1	0.4	1.2	1.6
Western larch[2/]									
Douglas-fir	.2	.8	1.0	.1	.3	.4	.3	1.1	1.4
Alpine fir		.1	.1					.1	.1
Western redcedar[3/]									
Engelmann spruce		.1	.1					.1	.1
Lodgepole pine		.5	.5		.2	.2		.7	.7
Black cottonwood					.1	.1		.1	.1
Total	.4	1.8	2.2	.3	1.5	1.8	.7	3.3	4.0

1/ Land capable of producing commercial timber and economically accessible, now or prospectively, and not reserved from cutting.
2/ The volume of western larch is negligible.
3/ The volume of western redcedar is negligible.

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Table 10. - Average annual cutting and fire drain[1] from the green-timber resource by species

Species	Saw-timber trees[2]			Saw-timber and cordwood trees[3]		
	Cutting	Fire	Total	Cutting	Fire	Total
	--- Thousand board feet[4] ---			--- Thousand cubic feet ------		
Ponderosa pine	31,191	167	31,358	5,194.0	36.9	5,230.9
Western larch	982	1	983	180.0	1.2	181.2
Douglas-fir	4,153	325	4,478	785.0	134.0	919.0
Alpine fir	212		212	42.0	1.0	43.0
Western redcedar	1		1	[5]		
Engelmann spruce	12	137	149	2.0	29.9	31.9
Lodgepole pine	33	97	130	13.0	22.1	35.1
Black cottonwood	1,700		1,700	366.0		366.0
Total	38,284	727	39,011	6,582.0	225.1	6,807.1

1/ Sawlog drain 1935-1940 inclusive. Minor products for various recent periods for which the data are available. Fire drain based on the average for the period 1931-1937 inclusive without any allowance for subsequent salvage.
2/ Includes the board-foot volume from stump to a commercial top.
3/ Includes the cubic-foot volume from stump to a 4-inch top inside bark of both trees of saw-timber size and less than saw-timber size.
4/ Scribner log scale.
5/ Less than 1,000 cubic feet.